

WPTF

Markets For Wind Energy

Image © Scottish Power

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Overview

- Electric Industry In Transition
- Electricity Pricing
- Utility Supply Planning Considerations
- National
- Regional
- Kansas
- Kansas Market for Wind
- Points to Ponder

Electric Industry In Transition

- Generation is essentially deregulated
- Transmission is primarily regulated at a National level – ensure open access and fairness to all players
- Distribution
 - Regulated – PUC sets rates based on cost of service
 - Deregulated – Market based rates with customer choice
- Early market setbacks have clouded market direction
 - California
 - Enron

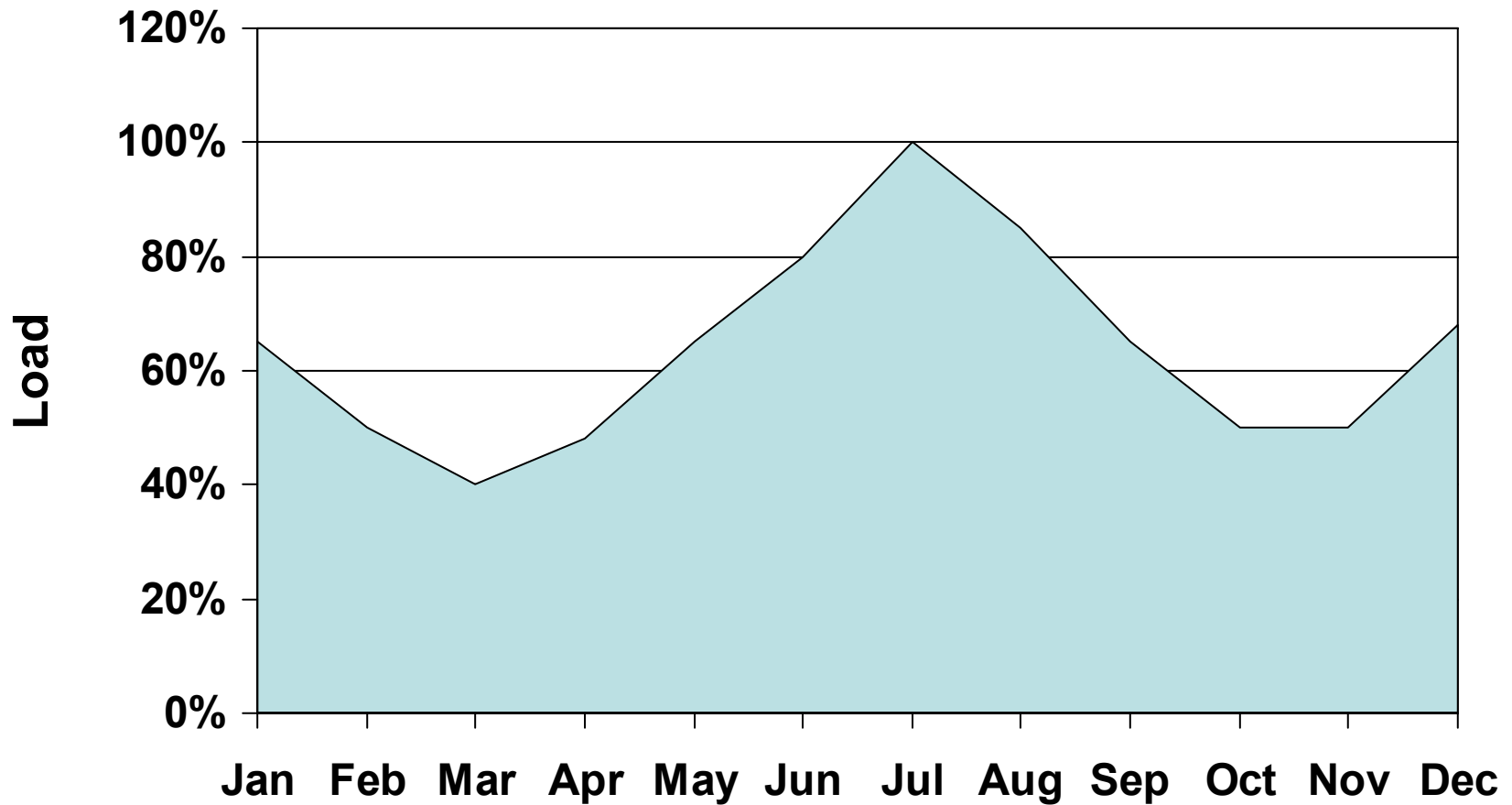
Electric Power vs. Energy

- Power (Capacity)
 - Rate electricity does work
 - Measured at a point in time
 - Units watt, kW or MW
- Energy
 - Amount of work done by electricity
 - Measured over a period of time
 - Units watthour, kWh, MWh

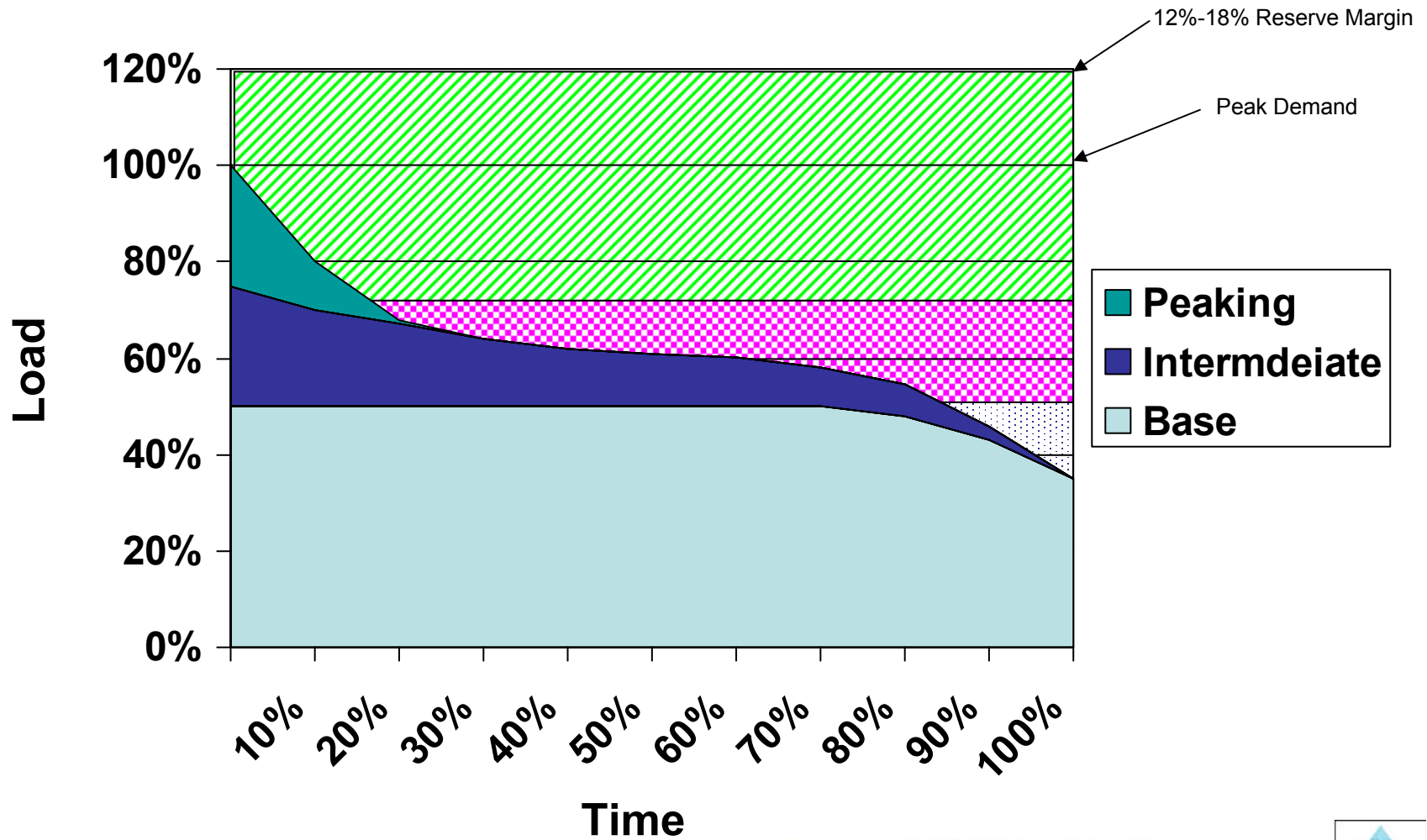
Electricity Pricing

- Capacity
 - Represents **fixed** costs (carrying charge, taxes, insurance, interest, labor, etc.)
 - Represents “rights” to output of unit
 - Units - \$/kW/mo or \$/kW/yr
- Energy
 - Represents **variable** costs (fuel, consumables, overtime, etc.)
 - Units - cents/kWh or \$/MWh
- Value
 - Minimal value if any for capacity due to intermittent nature
 - Premium value for energy due to environmental attributes
- Pricing
 - Rate-based – Cost plus return on investment
 - Independent Power Producer (IPP) – Competitive market price

Utility System Load



Load Duration Curve



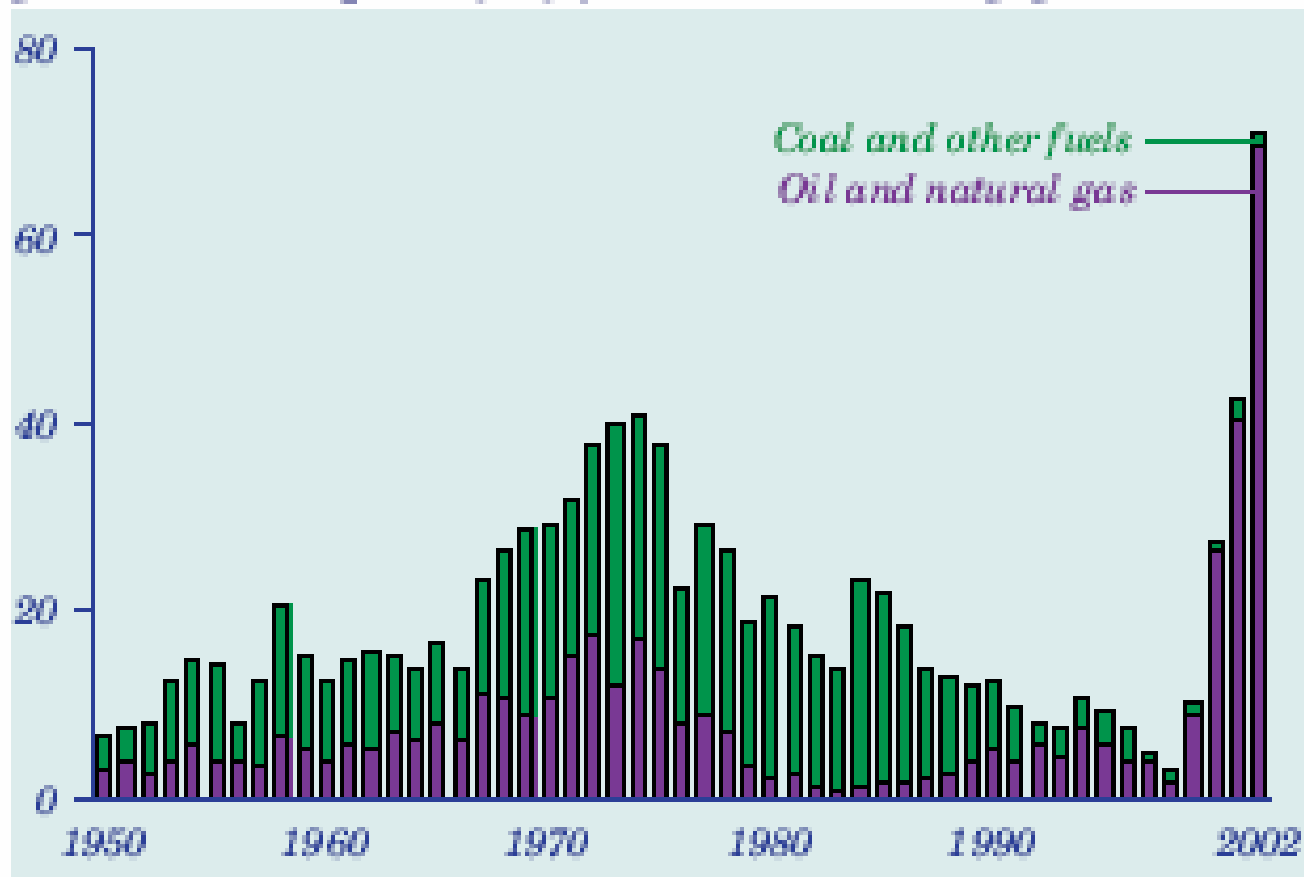
Implications of Utility Purchasing Considerations

- Many constraints (some conflicting) are considered in the planning process
 - Technical
 - Environmental
 - Social
- An excess of Capacity does not rule out the Utility's need for energy
 - Off-set high variable (fuel) costs
 - Environmental attributes (decrease fossil emissions)
- Conversely when a Utility is Capacity short, they will place a high value on reliability and the ability to schedule (dispatch) capacity

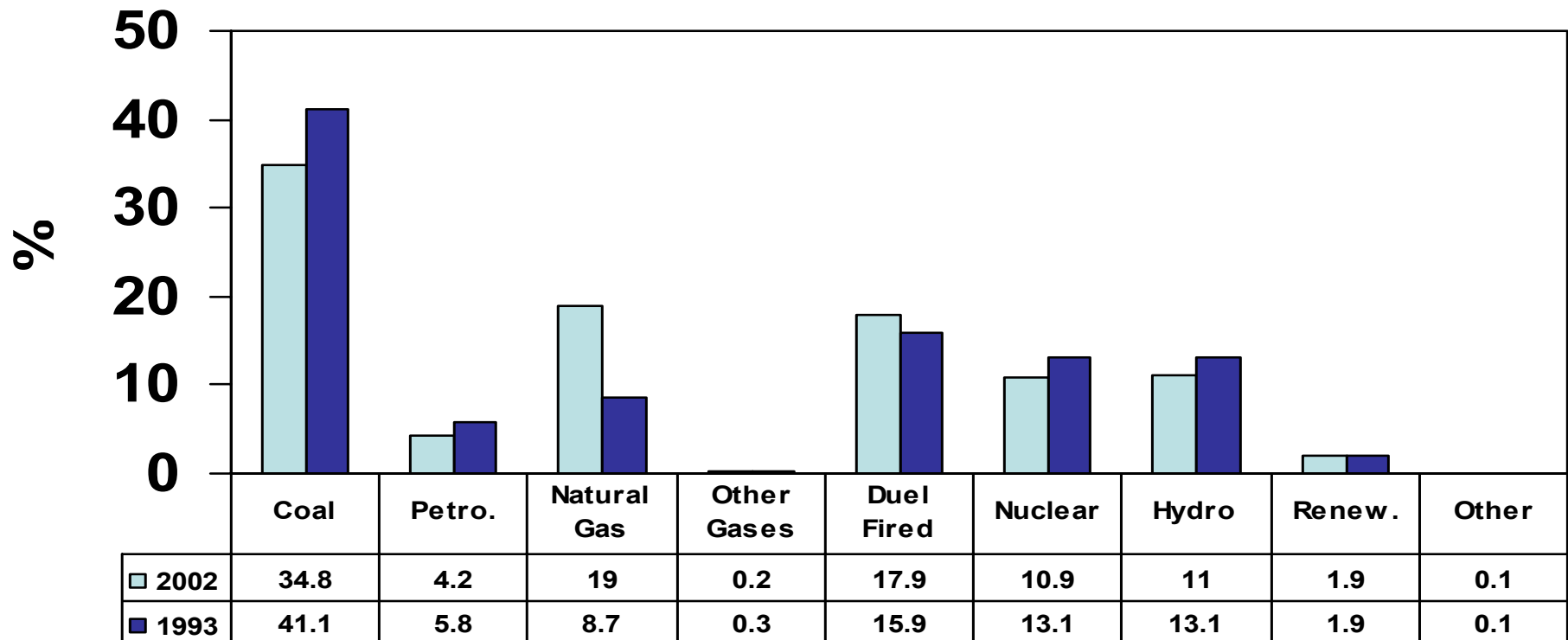
Existing Capacity US 2002 (MW)

Energy Source	Number of Generators	Nameplate Capacity	Net Summer Capacity	Net Winter Capacity
Coal	1,566	338,199	315,350	317,510
Petroleum	3,076	43,206	38,213	42,391
Natural Gas	2,890	194,968	171,661	184,904
Dual Fired	2,974	180,174	162,289	172,977
Other Gases	104	2,210	2,008	1,970
Nuclear	104	104,933	98,657	99,629
Hydro	4,157	96,343	99,727	98,806
Renewables	1,501	18,797	16,755	16,948
Other	41	756	641	645
Total	16,413	979,585	905,301	935,780

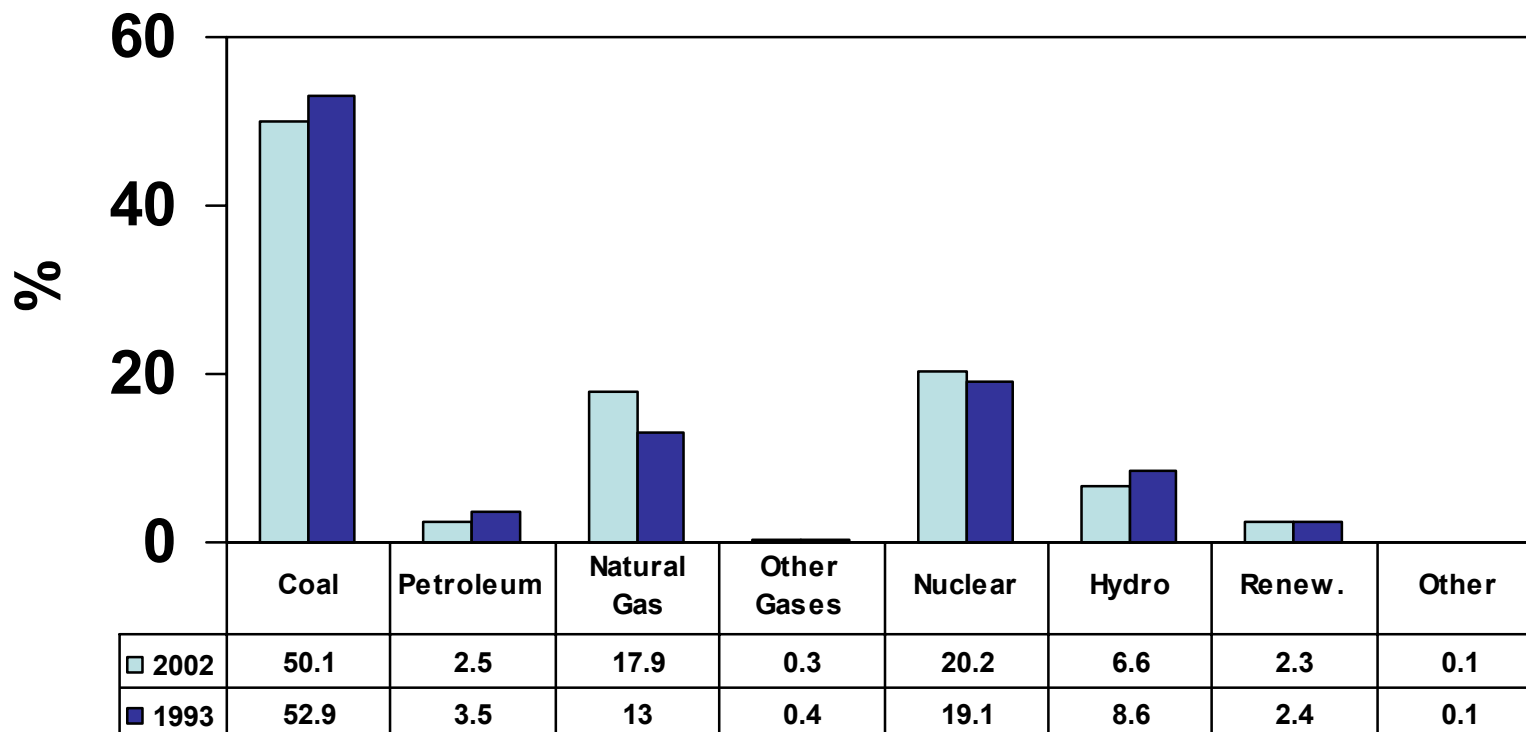
Figure 26. Annual additions to electricity generation capacity by fuel, 1950-2002 (gigawatts)



US Capacity (MW) by Fuel Source 1993 - 2002



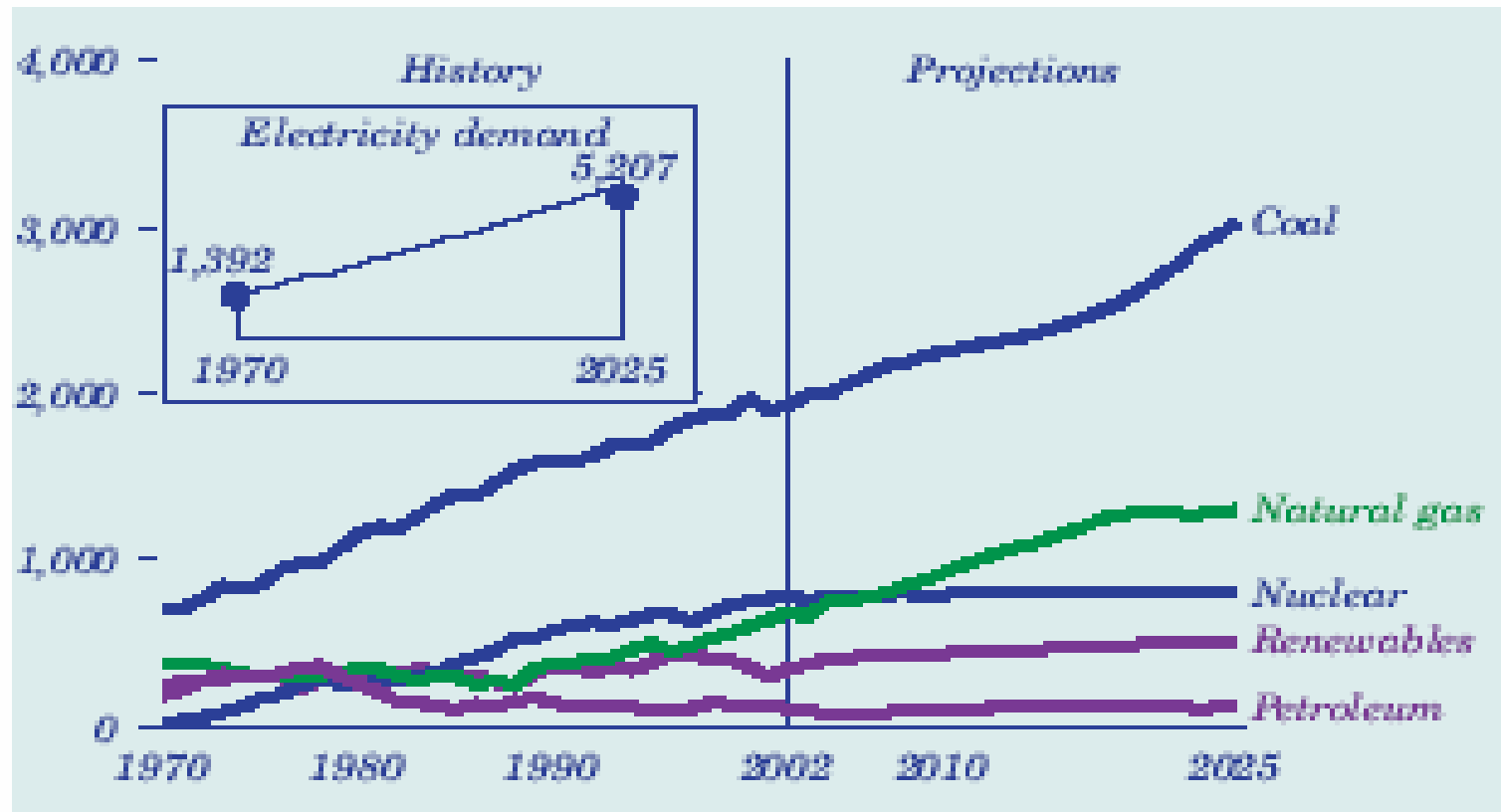
US Electricity Generation (MWHs) by Fuel Source - 2002



Planned Capacity Additions in US (MW)

Energy Source	2003	2004	2005	2006	2007
Coal	203	585	1,623	3,710	3,666
Petroleum	308	146	228	406	----
Natural Gas	70,063	39,445	35,077	32,150	9,346
Other Gases	----	----	----	1,162	----
Nuclear	----	----	----	----	----
Hydro	12	3	10	----	42
Renewables	807	353	178	----	112
Other	----	----	----	----	----
Total	71,392	40,531	37,116	37,429	13,166

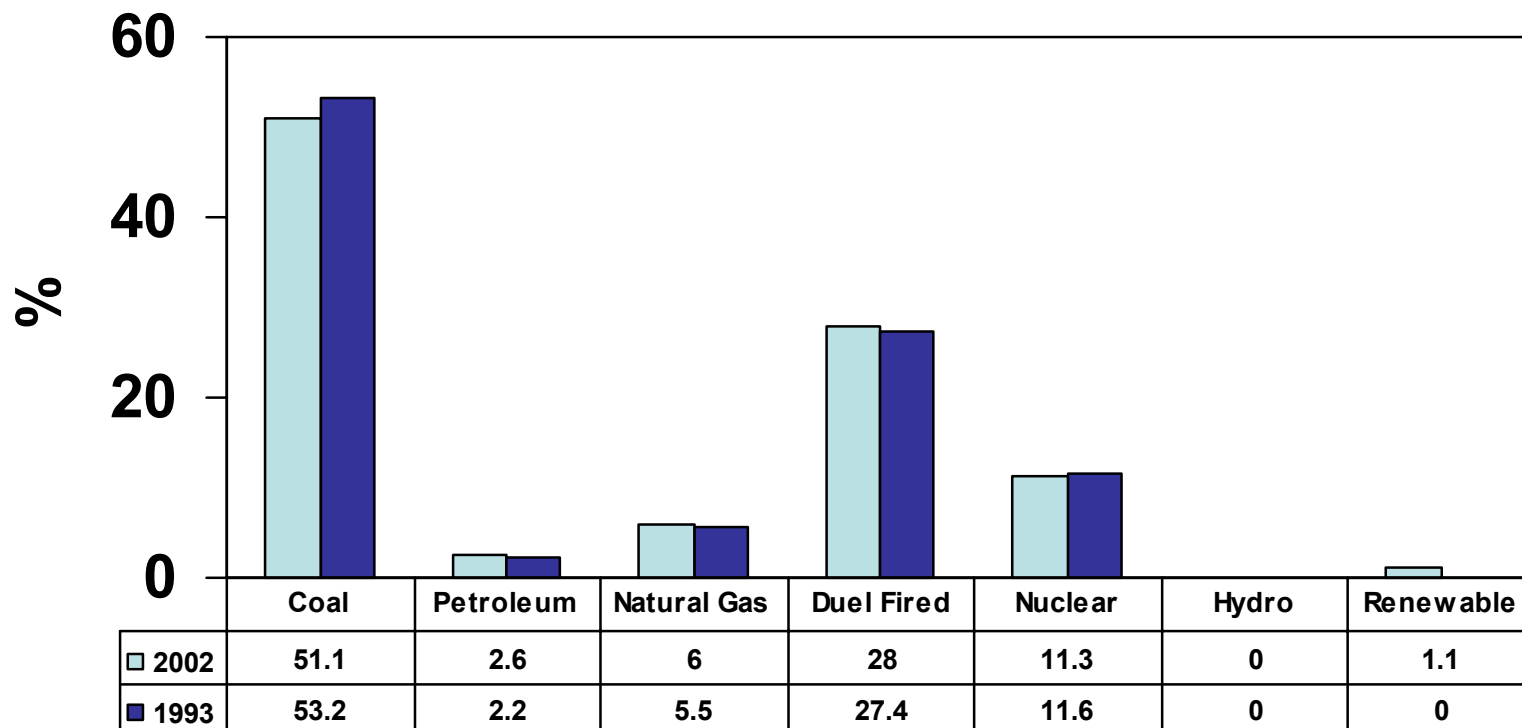
**Figure 4. Electricity generation by fuel, 1970-2025
(billion kilowatthours)**



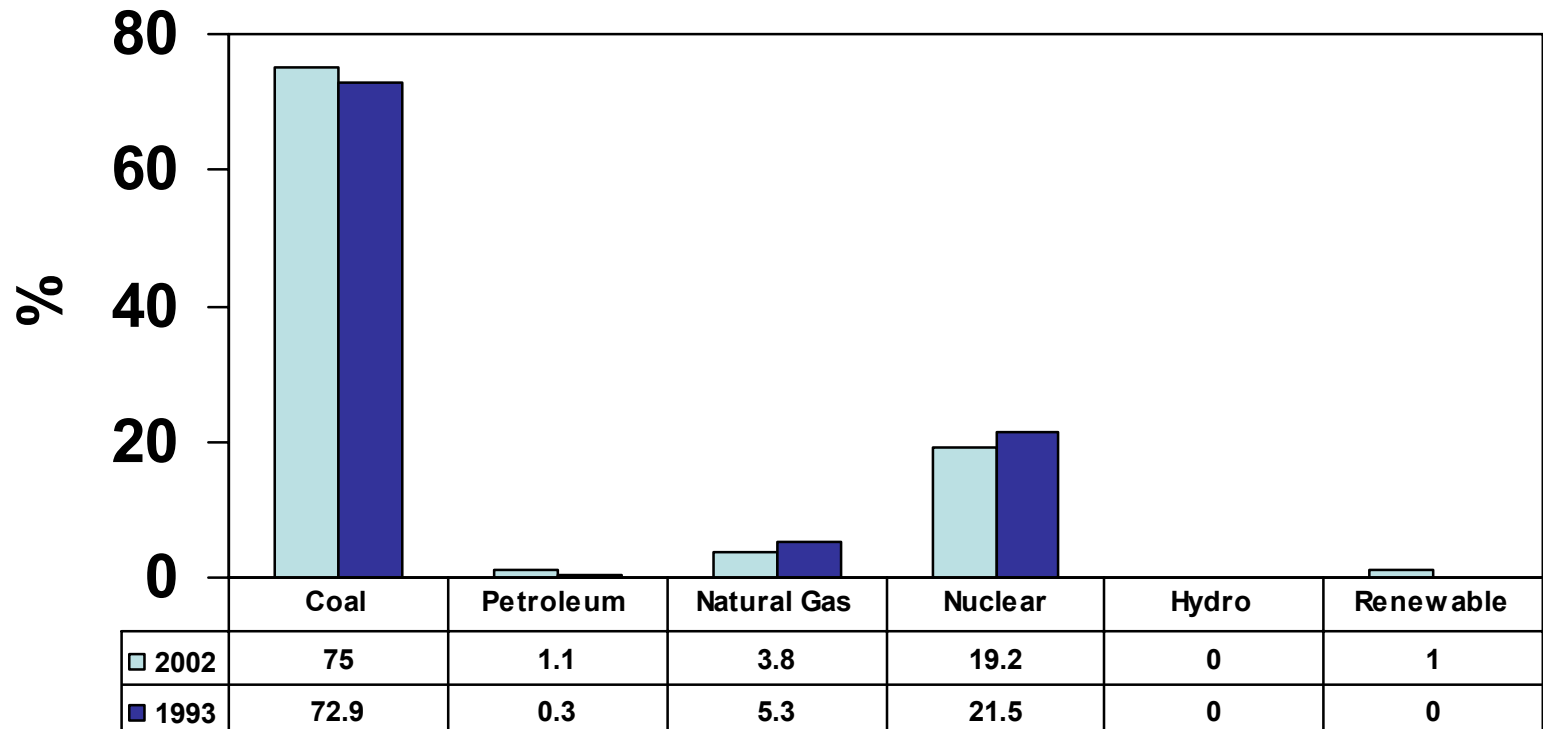
Regional

- Colorado
 - Gas Capacity (MW) 3.8% in 93 to 25.1% in 02
 - Gas Energy (MWHs) 4.4% in 93 to 19.8% in 02
 - Colorado PUC found wind to be most competitive new source generation for XCEL Energy to add
 - XCEL spokesman Mark Stutz anticipates \$16,000,000 fuel savings annually due to addition of new 162 MW wind farm to XCEL system
- Oklahoma
 - Gas Capacity (MW) 8.0% in 93 to 48.3% in 02
 - Gas Energy (MWHs) 31.5% in 93 to 35.6% in 02
 - Two new wind farms online fall 03 of approximately 150 MW

Kansas Capacity (MW) by Fuel Source - 2002



Kansas Electricity Generation (MWHs) by Fuel Source 1993 - 2002



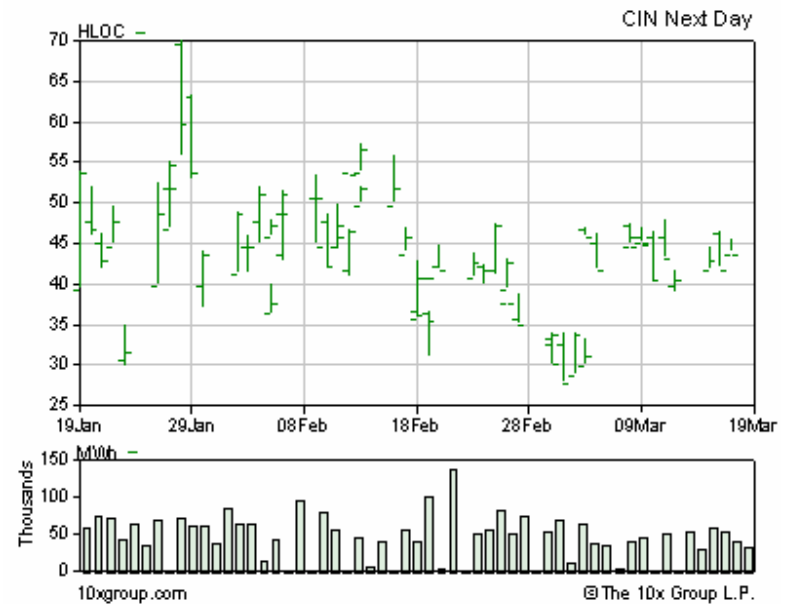
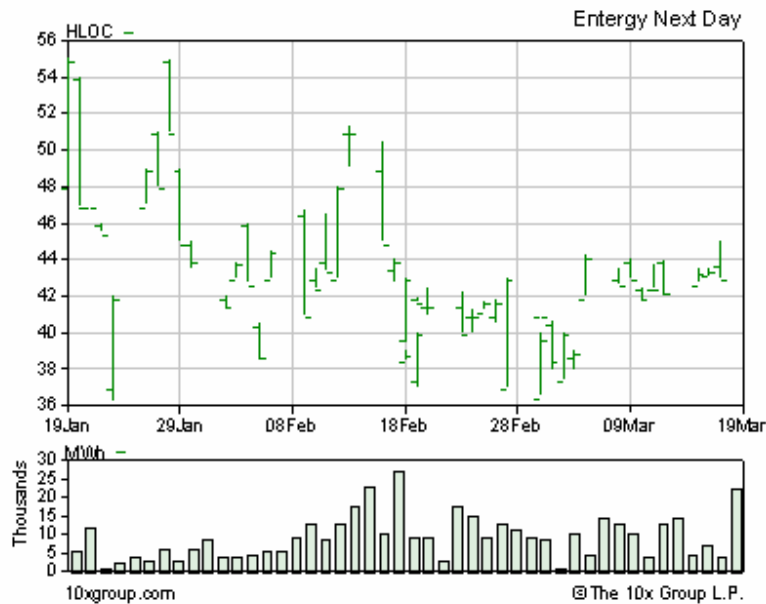
Production Costs for Kansas Generation - \$/MWH

Plant	Fuel	Net Capacity (MW)	Production Cost (\$/MWH)
JEFFREY	Coal	2,212	14.60
La Cygne – 1	Coal	1,362	16.00
La Cygne – 2			23.10
Wolf Creek	Nuclear	1,170	15.90
Gordon Evans Steam	Gas/Oil	833	38.20
Gordon Evans CT	Gas/Oil		60.30
Lawrence	Coal	598	15.60
Stateline CC	Gas	500	36.80
Hutchinson Steam	Gas/Oil	478	64.10
Hutchinson CT	Gas/Oil		153.60
Holcumb	Coal	360	*
Murray Gill	Gas/Oil	323	57.60
Quindaro	Coal	316	*
Teccumseh	Coal	284	17.00

*Not reported on FERC Form 1

Does Not Include Return of Investment or Return on Investment

Firm Power – Next Day Index



What Is Current Market For Kansas Wind Energy

- Westar Energy Issues RFP for up to 200 MW of Renewables 2/04
- Empire District Electric presents testimony to Kansas Senate Utilities Committee stating they are looking at up to 500,000 MWHs (150 MW at 38% capacity factor) of wind energy from Kansas Flint Hills
- Sunflower Electric announced plans to purchase 30 MW of wind energy in SW Kansas
- Numerous Kansas Municipals have signed (Letters of Intent) for wind energy

Points to Ponder

- Where will the natural gas come from to fuel all the new gas fired generation?
 - What will be the impact of new gas exploration?
 - How many more additional pipelines will be required to move the new gas to the new plants?
- How much Petroleum stock is consumed by unit trains hauling coal from the mines to the coal plants?
- How much additional electric transmission structure would be needed if all new plants were built next to the fuel source irregardless of where the load was to be served?

References

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